

Application No. 10/770,735
GAU 1733
Filed 02/03/2006

CLAIMS

1. (Previously Presented) A method for insitu minimization of infiltration and exfiltration of underground pipes having thickness between a first inner surface and a second outer surface comprising the following steps:

- a. Inserting into a pipe an inflatable and heatable bladder in communication with a controller and power source;
- b. Inflating the bladder to contact the first inner pipe surface;
- c. Heating the bladder to radiate heat through the pipe thickness to the ground;
- d. Injecting at least one chemical reactant into the ground from a ground surface;
- e. Using heat radiated through the pipe thickness to create a reaction product from the injected chemical reactant;
- f. Removing the bladder.

2. (Cancelled)

3. (Original) The invention of claim 1 wherein the means for heating is resistive electric heating within the bladder.

4. (Original) The invention of claim 1 wherein the reaction product is closed cell foam.

5. (Previously Presented) The invention of claim 1 wherein the bladder is in circumferential contact with the first inner surface of the pipe.

6. (Original) The invention of claim 1 wherein the reaction product reduces spaces within the ground and between the ground and the second outer pipe surface.

7. (Original) The invention of claim 1 further comprising placement of at least one liner material between the bladder and the first inner surface of the pipe wall.

8. (Original) The invention of claim 1 wherein the reactant is selected from a group consisting of a hybrid polyurethane or polyester/polyurethane blend resin, and epoxy resins combined with diluents, catalysts, blowing agents and surfactants, a acrylimide, and cementitious slurry.

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9. (Original) The invention of claim 3 wherein the means of resistive electric heating is carbon fibers.

Claims 10 through 18 are cancelled

19. (Previously Presented) A method for insitu minimization of infiltration and exfiltration of underground pipes having thickness between a first inner surface and a second outer surface comprising the following steps:

- a. inserting into the pipe a heatable and inflatable bladder in communication with the ground surface and having one or more liners containing thermo-setting or thermoplastic material;
- b. Inflating the bladder to press the liner to the first inner surface of the pipe;
- c. Injecting a reactant into the ground from the ground surface;
- d. Controllably heating the bladder to radiate heat through the thickness of the pipe to the ground proximate to the second outer surface;
- e. Using the heat to form the liner to the shape of the inner surface of the pipe;
- f. using the radiated heat through the thickness of the pipe in creating a closed cell foam reaction product from the injected reactant; and
- g. removing the inflatable bladder component.

20. Cancelled

21. (Original) The method of claim 19 wherein the method of heating is resistive electric heating.

22. (Original) The method of claim 19 wherein the ground proximate to the second outer surface of the pipe is heated prior to insertion of the reactant.

23. (Original) The method of claim 19 wherein the thermosetting material of the outer liner cures while pressed to the first interior surface by the inflated inner bladder.

Claims 24 and 25 are cancelled.

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26. (Previously Presented) A method for repairing an interface area between two intersecting pipes, each having a pipe wall thickness between a first inner surface and an outer surface and an interior diameter formed by the first inner surface, comprising the following steps:

- a. providing a flexible and expandable liner containing a hardenable heat responsive material wherein the liner has a cylindrical portion with a longitudinal axis of orientation and an outward protruding flange portion;
- b. placing the liner on an expandable and heatable mold;
- c. inserting the mold and liner into the interior diameter of the pipe interface of a first pipe and a second pipe;
- d. maintaining communication and power means to the mold from a controller;
- e. expanding the mold device to press the cylindrical liner segment to the inner surface of the first pipe and the liner flange segment to the inner surface of the second pipe;
- f. injecting a reactant from a ground surface into the ground proximate to the outer pipe surfaces at the interface;
- g. controllably heating the mold to radiate heat to the liner and through the thickness of the pipe to the ground;
- h. using the heat to form the liner to the shape of the inner diameter of the first pipe and the inner surface of the second pipe at the interface with the first pipe;
- i. Using the radiated heat in creating a reaction product of expanding close cell foam; and
- j. removing the mold.

Claims 27 through 37 are cancelled.

38. (Currently Amended) A method for insitu repair of underground pipes comprising the following steps:

- a. Inserting an inflatable bladder into an annulus of a pipe;
- b. Inflating the bladder to contact a first inner pipe surface;

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- c. Injecting at least one chemical reactant into the ground through a mechanism inserted from the ground surface into the ground outside of the pipe from a ground surface;
- d. Using the inflated bladder to minimize the infiltration of the reactant or a resulting reaction product into the pipe annulus; and
- f. Removing the bladder.